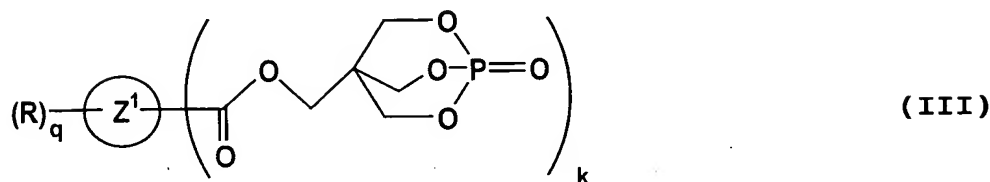
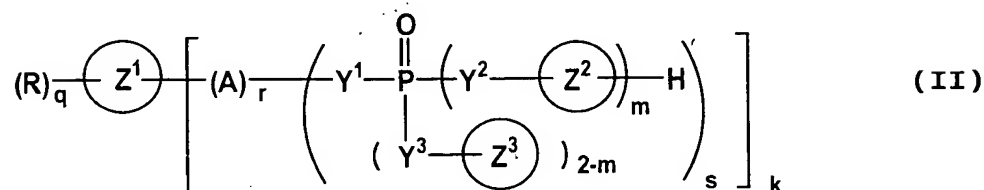
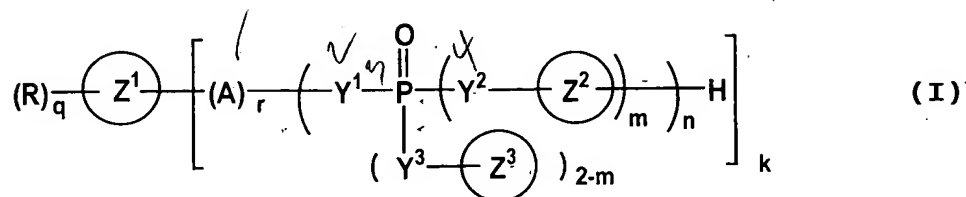


CLAIMS

1. A phosphorus-containing compound represented by the following formula (I), (II) or (III):

5



wherein Z^1 , Z^2 and Z^3 are the same or different, each representing a cycloalkane ring, a cycloalkene ring, a polycyclic aliphatic hydrocarbon ring or an aromatic hydrocarbon ring, in which these rings may have a substituent; R represents a halogen atom, a hydroxyl group, a carboxyl group, a halocarboxyl group, an alkyl group, an alkoxy group, an alkenyl group or an aryl group; A represents a polyvalent group corresponding to an alkane;

10

Y^1 , Y^2 and Y^3 are the same or different, each representing -O-, -S- or $-NR^1-$

wherein R^1 represents a hydrogen atom or an alkyl group;

5 k represents an integer of 1 to 6; m represents an integer of 0 to 2; n represents an integer of not less than 1; q represents an integer of 0 to 5; r represents 0 or 1; s represents an integer of 1 to 4; and

provided that when Z^1 is a cyclohexane ring, q is 0, and k is 1, factor r for A is 1; when Z^1 is a cyclohexane ring, q is 0, and k is 2 to 6, at least one of plural factors r for A is 1; and when Z^1 is a benzene ring and k is 1, the factor r for A is 1; when Z^1 is a benzene ring and k is 2 to 6, at least one of plural factors r for A is 1.

15 2. A phosphorus-containing compound according to claim 1, wherein the rings Z^1 , Z^2 and Z^3 each is a dicyclic or tricyclic aliphatic hydrocarbon ring.

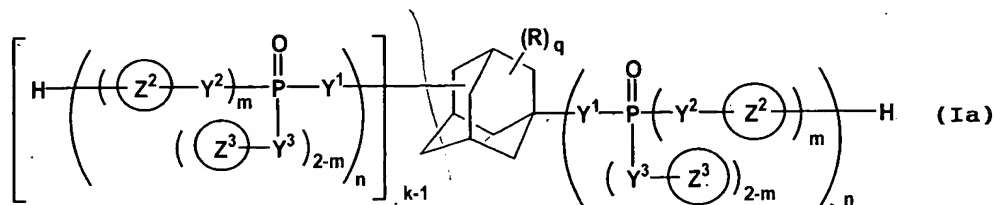
3. A phosphorus-containing compound according to claim 1, wherein the ring Z^1 is a norbornane ring, an adamantane ring, a tricyclo[5.2.1.0^{2,6}]decane ring, or a benzene ring, and the rings Z^2 and Z^3 each is an adamantane ring or a benzene ring.

4. A phosphorus-containing compound according to claim 1, wherein R is a halogen atom, a hydroxyl group, a C₁₋₄alkyl group, or a C₁₋₄alkoxy group in the formula (I).

5. A phosphorus-containing compound according to claim 1, wherein each Y^1 , Y^2 and Y^3 represents -O-.

6. A phosphorus-containing compound according to claim 1, wherein k is an integer of 1 or 2, n is 1, and q is an integer of 0 to 2.

7. A phosphorus-containing compound according to claim 1, wherein a phosphorus-containing compound of the formula (I) is represented by the following formula (Ia):



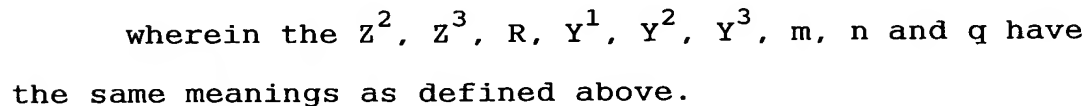
wherein the Z^2 , Z^3 , R, Y^1 , Y^2 , Y^3 , k, m, n and q have the same meanings as defined above.

8. A phosphorus-containing compound according to claim 7, wherein, in the formula (Ia), Z^2 and Z^3 are the same or different, each representing a benzene ring or an adamantane ring in which these rings may have a substituent; R is a halogen atom, a hydroxyl group, a C_{1-6} alkyl group, or a C_{1-6} alkoxy group; Y^1 , Y^2 and Y^3 each is -O- or -NR¹- (wherein R¹ represents a hydrogen atom or a C_{1-4} alkyl group)); k is an integer of 2 to 4; n is an integer of 1 to 3; and q is an integer of 0 to 4.

9. A phosphorus-containing compound according to claim 7, wherein, in the formula (Ia), Z^2 and Z^3 are the same or different, each representing a benzene ring which may have a substituent; R is a C_{1-4} alkyl group; n is 1; and

10. A phosphorus-containing compound according to claim 7, wherein a compound represented by the formula (Ia) is an adamantylbis, tris or tetrakis-(diC₆₋₁₀aryl phosphate) or an adamantylbis, tris or tetrakis(diC₆₋₁₀aryl phosphoramidate).

12. A phosphorus-containing compound according to claim 1, wherein a compound of the formula (I) is represented by the following formula (Ib):



13. A phosphorus-containing compound according to
claim 12, wherein, in the formula (Ib), Z^2 and Z^3 are the
same or different, each representing a benzene ring or an
adamantane ring in which these rings may have a substituent;
R is a halogen atom, a hydroxyl group, a C_{1-6} alkyl group, or
a C_{1-6} alkoxy group; Y^1 , Y^2 and Y^3 are the same or different.

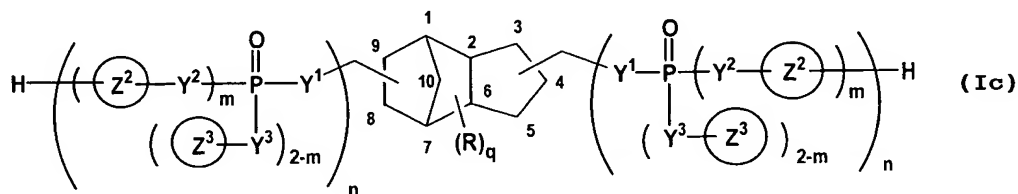
each representing -O- or -NR¹- wherein R¹ represents a hydrogen atom or a C₁₋₄alkyl group; and q is an integer of 0 to 4.

14. A phosphorus-containing compound according to claim 12, wherein, in the formula (Ib), R is a hydroxyl group, a C₁₋₄alkyl group, or a C₁₋₄alkoxy group, and q is an integer of 0 to 2.

15. A phosphorus-containing compound according to claim 12, wherein a compound represented by the formula (Ib) is an adamantyldiC₆₋₁₀arylphosphate or a diadamantyl C₆₋₁₀arylphosphate.

16. A phosphorus-containing compound according to claim 12, wherein a compound represented by the formula (Ib) is adamantyldiphenylphosphate, dimethyladamantyl diphenylphosphate, or bis(adamantyl)phenylphosphate.

17. A phosphorus-containing compound according to claim 1, wherein a compound of the formula (I) is represented by the following formula (Ic):



20

wherein the Z², Z³, Y¹, Y², Y³, m, n and q have the same meanings as defined above.

18. A phosphorus-containing compound according to

claim 17, wherein, in the formula (Ic), Z^2 and Z^3 each is a benzene ring which may have a substituent; R is a halogen atom, a hydroxyl group, a C_{1-6} alkyl group, or a C_{1-6} alkoxy group; and Y^1 , Y^2 and Y^3 are -O-.

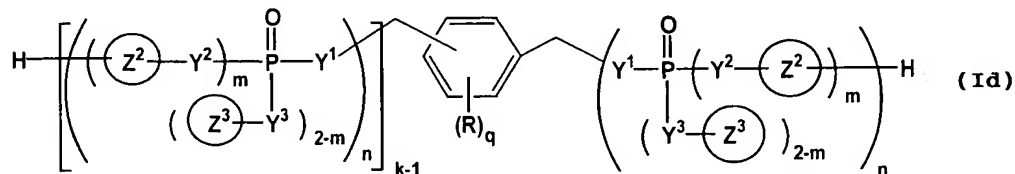
5 19. A phosphorus-containing compound according to claim 17, wherein a compound represented by the formula (Ic) is bis[(di C_{6-10} arylphosphoroxy)methyl]tricyclo[5.2.1.0^{2,6}]decane.

10 20. A phosphorus-containing compound according to claim 17, wherein a compound represented by the formula (Ic) is bis[(diphenylphosphoroxy)methyl]tricyclo[5.2.1.0^{2,6}]decane.

15 21. A phosphorus-containing compound according to claim 17, wherein a compound represented by the formula (Ic) is (4R,8S)-bis(diphenylphosphoroxymethyl)-(1R,2S,6R,7R)-tricyclo[5.2.1.0^{2,6}]decane.

22. A phosphorus-containing compound according to claim 1, wherein a compound of the formula (I) is represented by the following formula (Id):

20



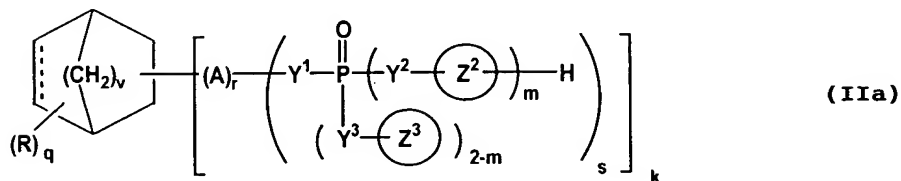
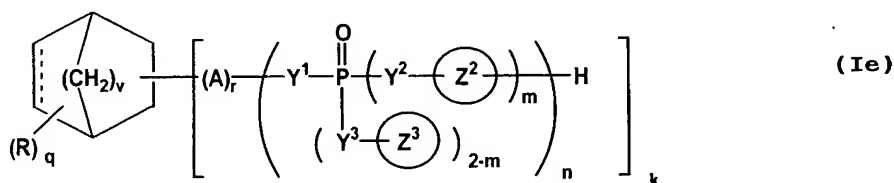
wherein the Z^2 , Z^3 , R, Y^1 , Y^2 , Y^3 , m, n and q have the same meanings as defined above.

23. A phosphorus-containing compound according to

claim 22, wherein, in the formula (Id), Z^2 and Z^3 each is a benzene ring which may have a substituent; and Y^1 , Y^2 and Y^3 are -O-.

24. A phosphorus-containing compound according to
5 claim 22, wherein a compound represented by the formula
(Id) is xylyleneglycolbis(diphenylphosphate).

25. A phosphorus-containing compound according to claim 1, wherein a compound of the formula (I) or (II) is represented by the following formula (Ie) or (IIa):



wherein the following structure

means a single bond or a double bond, v is an integer of 0 to 2; and Z^2 , Z^3 , R , A , Y^1 , Y^2 , Y^3 , m , n , q , r and s have the same meanings as defined above.

15 26. A phosphorus-containing compound according to
claim 25, wherein, in the formula (Ie) or (IIa), Z^2 and Z^3
each is a benzene ring which may have a substituent; R is

a halogen atom, a hydroxyl group, a C₁₋₆alkyl group which may have a substituent, a C₁₋₆alkoxy group which may have a substituent, or an alkenyl group which may have a substituent; and Y¹, Y² and Y³ are -O-.

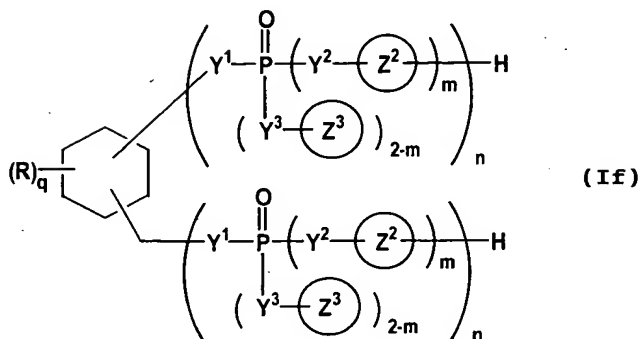
5 27. A phosphorus-containing compound according to claim 25, wherein, in the formula (Ie), n is 1; q is an integer of 0 to 2; r is 1; and s is an integer of 1 to 2.

28. A phosphorus-containing compound according to claim 25, wherein a compound represented by the formula
10 (Ie) or (IIa) is bis(diphenylphosphoroxy)norbornane;
bis(diphenylphosphoroxyC₁₋₄alkyl)norbornane;
bis(diphenylphosphoroxy)-4-C₂₋₄alkenylcyclohexane;
(diphenylphosphoroxyC₁₋₄alkyl)cyclohexene; mono, di or
tri-C₁₋₄alkyl(diphenylphosphoroxyC₁₋₄alkyl)cyclohexyl
15 phosphate; or bis(diphenylphosphoroxy)-[bis(diphenyl
phosphoroxy)C₁₋₄alkyl]cyclohexane.

29. A phosphorus-containing compound according to claim 25, wherein a compound represented by the formula (Ie) or (IIa) is 2,3-bis(diphenylphosphoroxy)norbornane,
20 2,5-bis(diphenylphosphoroxymethyl)norbornane, 1,2-bis(diphenylphosphoroxy)-4-vinylcyclohexane, 1-diphenylphosphoroxymethyl-3-cyclohexene, 3,3,-dimethyl-5-(diphenylphosphoroxymethyl)cyclohexyl phosphate, or
1,2-bis(diphenylphosphoroxy)-4-[1',2'-bis(diphenyl
25 phosphoroxy)ethyl]cyclohexane.

30. A phosphorus-containing compound according to claim 25, wherein a compound of the formula (Ie) is

represented by the following formula (If):

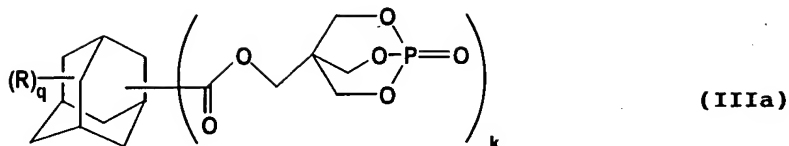


wherein Z^2 , Z^3 , R, Y^1 , Y^2 , Y^3 , m, n and q have the same meanings as defined above.

31. A phosphorus-containing compound according to claim 30, wherein, in the formula (If), Z^2 and Z^3 are the same or different, each representing a benzene ring; R is a halogen atom, a hydroxyl group, a C_{1-6} alkyl group, or a C_{1-6} alkoxy group; and Y^1 , Y^2 and Y^3 are the same or different, each representing -O- or -NR¹-.

32. A phosphorus-containing compound according to claim 30, wherein a compound represented by the formula (If) is 1-diphenylphosphoroxymethyl-3-diphenylphosphoroxymethylcyclohexane or 3,3,-dimethyl-5-(diphenyl phosphoroxymethyl)cyclohexylphosphate.

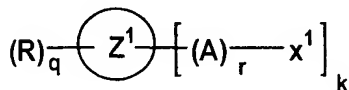
33. A phosphorus-containing compound according to claim 1, wherein a compound of the formula (III) is represented by the following formula (IIIa):



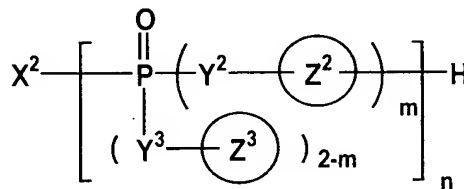
wherein R, q and k have the same meanings as defined above.

34. A phosphorus-containing compound according to claim 33, wherein, in the formula (IIIa), R is a carboxyl group, a halocarboxyl group, or a C₁₋₄alkyl group.

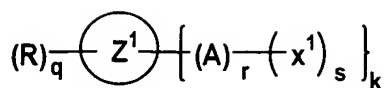
35. A process for producing a phosphorus-containing compound represented by the formula (I), (II) or (III) recited in claim 1, which comprises reacting a compound represented by the following formula (I-1), (II-1) or (III-1) with a compound represented by the following formula (I-2), (II-2) or (III-2):



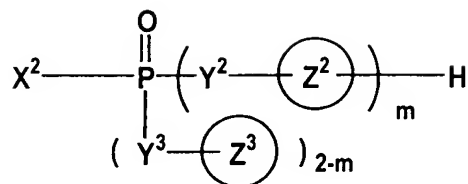
(I-1)



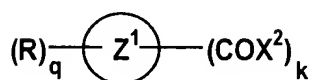
(I-2)



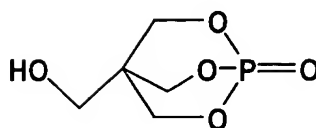
(II-1)



(II-2)



(III-1)



(III-2)

wherein X^1 represents a hydroxyl group, a thiol group,
 an amino group, or a substituted amino group; X^2 represents
 a halogen atom, a hydroxyl group, or an alkoxy group; and
 the Z^1 , Z^2 , R , Y^1 , Y^2 , Y^3 , k , m , q , r and s have the same
 meanings as defined above.